

A TRIBUTE TO COURTENAY SMITHERS AND HIS BUTTERFLY MIGRATION STUDIES

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Abstract

The contribution of Courtenay Smithers to Australian butterfly migration studies is discussed and a few noteworthy migrations not previously published are recorded.

Introduction

I first met Courtenay Smithers in 1961. I had recently arrived in Australia from the United Kingdom and Courtenay had arrived from Rhodesia less than twelve months previously. We shared an interest in British birds and both of us had prior experience with butterfly migration. Courtenay had witnessed the mass migrations of the African Migrant, *Belenois aurota* (Fabricius, 1793) and I had reported on records of migrant butterflies in Ireland.

In the 19th century, British lepidopterists found it difficult to accept that butterflies migrated. They could not '*account for an almost complete absence one year followed by a superabundance the next. They somehow believed that butterflies successfully 'hibernated' to re-emerge the following spring and that, being very mobile, their presence in large numbers was the result of movement from elsewhere in the kingdom*' (Salmon 2000).

Williams (1930) documented early studies on butterfly migration. Common and Waterhouse (1972, 1981) devoted almost four pages to it, with special reference to the work of the entomologists at the Australian Museum, in particular the marking of the wings of the Monarch followed by release and, hopefully, the eventual recapture of some of the specimens. Details were given of the need for recording butterfly migrations: *i.e.* species name (and specimens), locality, compass direction, time of day, date and the number of individuals passing over a measured distance in a given time.

A migration is noted when 'large numbers of butterflies may be seen flying in one direction for hours on end or for several days' (Common and Waterhouse 1972). These butterflies fly with a purpose and are rarely distracted from it; they fly over buildings or trees rather than fly around them. On the other hand, there are 'some species of butterflies that may, in favourable seasons, extend their distribution southward by hundreds of kilometres' (Common and Waterhouse 1972). Sydney is an ideal place to record these range extensions, as many of Courtenay's record show. Temporary range extension or full-on migration must be important to the biology of each species involved and is a part of butterfly biology that certainly needs further investigation.

Shortly after arriving in Australia, Courtenay started to bring together all the records of migrating butterflies that he could find, along with new and current records from members of the Entomology Section of the Royal Zoological

Society and from the many correspondents who were part of his Monarch (*Danaus plexippus* (Linnaeus, 1758)) labelling project (Fig. 1). Much of this information was published from 1961 to 1995 in the 28 papers he wrote dealing with butterfly migration. He first published on insect migration in Australia as early as 1961, followed by a paper on butterfly migration in 1963. His series of papers entitled 'Migration Records in Australia, parts 1-5' (Smithers 1970b, 1978, 1983a, 1983b, 1985) brought together most of the previous records of Australian butterfly migration, plus those involving the Odonata, Homoptera, Coleoptera, Diptera and Hymenoptera.



Fig. 1. Volunteers Justine O'Regan and Alana Thomas helping Courtenay Smithers tag and record Monarch butterflies in the 1960s.

***Danaus plexippus*, the Monarch butterfly**

On 8 August 1962, Courtenay and I commenced the first marking of Monarch butterflies (*Danaus plexippus*) in Australia, by using tiny handwritten labels glued to the underside of a hind wing using Mendene thinned with ethyl acetate (Fig. 2), with some successfully recaptured (Fig. 3). In 1963, the programme commenced in earnest, using small self-adhesive labels produced by Avery Scales; however, this still required the numbers to be handwritten. The cell of a forewing had the scales removed by gently rubbing between finger and thumb and the label then folded and attached to the wing (Fig. 4) – this meant that there was no need to use glue (a rather messy procedure) and the label was more easily seen. This method had been used earlier by Canadian researchers. Courtenay, through the Australian

Museum, gathered together a great many collaborators from all over Australia, but mainly from NSW, and many thousands of Monarchs and other species were labelled, with the results of this study published by Smithers (1972, 1977).



Fig. 2. Monarch number 995 marked with a trial label glued to hindwing underside.

A landmark in Australian Monarch studies was when the first overwintering aggregation sites were recorded by Smithers (1965) south-west of Sydney (Fig. 5). I have a note recording that, on 23 April 1967, at the Razorback (near Camden, NSW) overwintering site, a small group of us labelled 1,400 Monarchs in one day from the very large clusters that had assembled that winter. I'm not sure how many butterflies were labelled during the entire length of the programme but I still have a few unused labels and the numbers on them are in excess of 69,000.

The Canadian Entomologist Frederick Urquhart pioneered the labelling of *Danaus plexippus* and the results of his studies into the movements of the Monarch in North America were published in his book (Urquhart 1960). Courtenay was able to discuss his own studies on the Monarch with Urquhart during a visit to Toronto, Canada in 1986. His Australian studies were included in a review of Monarch migration in Australia by James (1993).



Figs 3-4. Tagged Monarchs, *Danaus plexippus*: (3) recaptured number 4733 with hindwing tag; (4) Canadian example with forewing tag.



Fig. 5. Courtenay Smithers collecting Monarch butterflies at an aggregation in 1968.

***Belenois java teutonia*, the Caper White**

A species conspicuously absent from Courtenay's reviews was the Caper White, *Belenois java teutonia* (Fabricius, 1775). He had so much material on the migrations of this butterfly, much of it from his many correspondents as well as his own records, that he often expressed frustration that the job of making any sense of it seemed insurmountable, particularly as he was so involved in his museum work as well as his research interests in, particularly, the Psocoptera. As a result, Courtenay did not publish any records of the migrations of the Caper White. However, he and I discussed the migrations of this species at length and we concluded that the main breeding area of this species is that vast area of southern Queensland and New South Wales west of the Great Dividing Range, where larval food plants such as the Warrior Bush *Apophyllum anomalum* F. Muell and the Native Orange *Capparis mitchellii* Lindl (both Capparaceae) grow.

The native food plants occur naturally only north of Griffith, NSW, which poses one of the key questions as to why the migrations seem to be so maladaptive, given that the butterflies often fly in such huge numbers away from potential breeding localities such as, for example, into all of Victoria. The butterflies emerge in large numbers in late October-November, with freshly emerged females soon mated and ready to lay eggs on any suitable food plant they come across. They normally fly in a northeasterly direction but their exact route varies annually, depending on the prevailing winds at the time. A strong westerly can cause them to fly through Canberra and as far eastwards as Sydney and Brisbane and beyond. During years when the westerlies fail to coincide with their migrations, very few Caper Whites may be seen in Sydney.

On 28 November 1969, Courtenay recorded 'a tremendous "invasion"' of Caper Whites on the western side of Lord Howe Island (Smithers 1970a). Reports from Australia indicated that a large-scale migration was taking place in eastern Australia at that time, with the butterflies moving in a northwesterly direction. These were the first Caper White butterflies recorded from Lord Howe Island, suggesting that with appropriate conditions this species is easily blown off course. Specimens were seen on Lord Howe Island for only a few days and the drop in numbers by 30 November suggests that they continued their migratory movement, leaving the island and presumably becoming 'lost at sea'. Similarly, on 24/25 November 1987, I noted large numbers ('a cloud') of Caper Whites coming straight in to the shore off the sea at Surfers Paradise, Queensland, flying just above wave height. They continued up the beach and across the main road. Very few were seen on the 26th and only one on the 27th. Common and Waterhouse (1981) wrote of the Caper White butterfly: 'Immense migratory flights of this species frequently occur in southern Queensland and New South Wales, and sometimes extending into Victoria. ... At Canberra it is not uncommon to see this species flying steadily north to north-east during November'.

Discussion and new observations

The general public tend not to notice migrating butterflies unless the movement is spectacular, such as the migrations of Caper Whites. Large numbers of white butterflies moving in one direction for days on end are difficult to ignore. My first encounter with this phenomenon was in 1963 at the Sydney suburb of Ryde. The migration started as a trickle on 23 November with one butterfly seen at 10.00 h, nine from 11.30–12.30 h and, from 12.45 to 13.45 h, 196 butterflies were recorded over a 15 metre front flying in a NNE direction. This is the equivalent of over 13,000 per hour over a 1 km front. This migration quickly petered out, with one Caper White sighted on 24 November and another on the 29th. A much more spectacular migration of Caper Whites occurred during November 1966. I observed this at both Ryde and Chatswood (another Sydney suburb). All the butterflies were flying in a northerly direction, first noticed on 1 November and extending until 20 December. At its peak on 28 November, I recorded 180+ butterflies over a 25 metre front for just 5 minutes, an estimate of 86,400+ butterflies per km front per hour. It is not unusual for a migration to continue from dawn until dusk suggesting that, in this example, as many as 7 million+ Caper Whites passed through Sydney in one day. Migrations such as this have been observed from Sydney west to the Blue Mountains, a distance of approximately 100 km!

An example of the general public failing to notice migrating butterflies occurred during November 1986, while I and a number of teachers were supervising children at Ryde swimming pool. For some time I watched Painted Lady butterflies, *Vanessa kershawi* (McCoy, 1868), flying south across the pool. After a while I asked the other teachers if they had noticed the migrating butterflies. No, they hadn't and they were astonished when they realised what was happening around them and how unobservant they were.

Since the last of Courtenay's papers on butterfly migration was published (Smithers 1995), I have observed quite a number of migrations, particularly at my daughter's property at Tuchekoi, near Cooroy on the Sunshine Coast, Queensland. There I have recorded 10 species migrating, one not previously recorded and, on occasions, three species migrating in different directions at the same time. On 22 October 2002, from 11.08 to 11.23 h, over a 33 metre front, I observed 23 *Belenois java teutonia* flying in a NW direction, three *Catopsilia pomona* (Fabricius, 1775) flying southeasterly and nine *Elodina angulipennis* (P.H. Lucas, 1852) flying in a SE direction at a height of 1-3 metres. (Two voucher specimens of *E. angulipennis* were collected). Two days previously, at the same locality, there were 54 *B. j. teutonia* flying to the NW, seven *C. pomona* flying to the SE and three *Junonia villida* (Fabricius, 1787) flying to the west.

Also at Tuchekoi, on 25 and 27 December 1993 I observed three species of butterfly in a spectacular southerly migration. Blue Tigers, *Tirumala hamata*

(W.S. Macleay, 1826), Lemon Migrants, *C. pomona* and Pale green Triangles, *Graphium eurypylus* (Linnaeus, 1758) were observed flying over a 50 metre front during four 15 minute sessions over 3 days (Table 1). The migration continued all day on 26 December until a quite violent storm arrived at 1500 h, with the migration continuing on the 27th. The Blue Tigers flew in a leisurely but determined flight, while the Lemon Migrants and the Pale green Triangles flew at a much faster pace. It is interesting to note that 'resident' Blue Tigers were not involved in the migration.

Table.1. Southerly migration of three butterfly species at Tuche-koi, near Cooroy, SE Queensland, on 25 and 27 December 1993. Numbers were recorded flying over a 50 metre front.

Butterfly species	25 Dec.		27 Dec.		Height above ground
	1030-1045 h	1215-1230 h	1530-1545 h	1100-1115 h	
Blue Tiger <i>Tirumala hamata</i>	22	29	11	25	0.5-2 m
Lemon Migrant <i>Catopsilia pomona</i>	9	9	-	21	2-3 m
Pale green Triangle <i>Graphium eurypylus</i>	11	3	9	11	1-3 m
Temperature	29°C	32°C	30°C	29°C	

Many of the butterfly species that migrate also have a return migration but usually in much smaller numbers. The major flights of *B. java teutonia* in October-November are often spectacular, with reports reaching major Sydney newspapers; however, the return flights the following September are numerically very small and may only be observed by alert lepidopterists.

Although Ian Common worked extensively on bogong moth migration, Courtenay was the only person to have recorded butterfly migration in Australia seriously during the past 50 years. He explored what is perhaps the most interesting and least understood aspect of butterfly biology. We owe him a debt of gratitude for his work on Australia's migratory butterflies and other insects and, in particular, his studies of the Monarch, *Danaus plexippus*. Apart from a posthumous paper in this memorial issue (Smithers 2012), it is almost 20 years since his last publication on butterfly migration; thus there is an opportunity for someone to continue to record and publish details of this fascinating phenomenon. Courtenay's paper records of Caper White migrations are maintained in the Australian Museum archives and are available to researchers.

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